

ABSTRACT

A method and an apparatus for drying, separating, comminuting and purification of wetted solids, especially those that may have a tendency to be moderately abrasive or agglomerate and adhere to the walls of equipment and especially mixtures that may contain pathogens are disclosed. The method comprises the steps of (1) moving the wet solids under high vacuum in heated air stream by a high vacuum pneumatic conveyor; (2) directing them against a static pulverizer disc at high speed, comminuting the wet solid by impingement on the static, solid, convex disc; (3) centrifugation of the reduced size wet solids in a special high speed cyclone that has a high velocity air bearing between the cyclone wall and the solid particles that is generated by sucking clean air passing through a specially constructed parallel venturi ahead of the cyclone; (4) flashing the vapor from the solids into heated air under vacuum within the high speed cyclone; (5) separating the heavy solids from the light solids in the high speed cyclone; (6) refluxing and back mixing the heavy solids from the cyclone back to the static pulverizer and first cyclone through a coaxially supporting high velocity air bearing that is created by sucking clean air through a special coaxial venturi in the duct; (7) back mixing the light solids from the top of the first cyclone into and second and third (or more) stages of high speed cyclones below into a subtended, gravity driven, central mixing chamber; (8) refluxing the mixed, comminuted solids from the series of cyclones downward back to the static pulverizer; (9) collecting the driest, lightest solids from top of the final stage of cyclones in a high efficiency cyclone and baghouse; (10) passing the saturated air from the process through a liquid ring vacuum pump, which also provides the motive force for the process then through the vacuum pump separator; (11) passing the separated saturated air through a liquid ring compressor and recovering the condensable and soluble contents thereby by the liquid ring compressor's natural scrubbing action into the seal liquid; (12) recirculating the seal liquid from the compressor separator bottoms, thereby concentrating the soluble and condensable loads from the vacuum pump discharge air stream; (13) discarding the air and residual vapor and non condensable through a stack. The solids can be of any nature so long as they are soft enough (with crush strength less than limestone) to be pulverized in the static pulverizer and the liquid can be of any

composition or nature, polar or non-polar. The pathogens may especially be from food products, compost or animal and human waste source in the liquid or solid phase of the feed mixture. The soluble and condensable can be anything soluble or condensable in the seal liquid of the liquid ring compressor. The apparatus of the present invention comprises a high velocity air bearing in coaxial flow vacuum pneumatic conveying duct; two or more high velocity parallel flow high centrifugal force cyclones connected in series; an inline static pulverizer; a central mixing chamber; a dry product recovery system comprised of a high efficiency cyclone and baghouse in series; a liquid ring vacuum pump and separator; a liquid ring compressor and separator; recirculation pumps and a seal water heat interchanger to keep the compressor seal liquid cool.

4 Claims, 4 Drawing Sheets